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REPORTS

TO THE

LOCAL GOVERNMENT BOARD

ON

PUBLIC HEALTH AND MEDICAL
SUBJECTS.

(NEW SERIES No. 51.)

Dr. S. Monckton Copeman's Report to the
Local Government Board on an outbreak
of Enteric Fever in the Borough of Eccles,
Lancashire, due to the consumption of
ice-cream.



LONDON:

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Dr. S. Monckton Copeman's Report to the Local Government Board on an outbreak of Enteric Fever in the Borough of Eccles, Lancashire, due to the consumption of ice-cream.

ARTHUR NEWSHOLME,
Medical Officer,
10th May, 1911.

On November 18th, 1910, the Board received a telegram from Dr. Hamilton, Medical Officer of Health for the Borough of Eccles, stating that forty cases of enteric fever had been notified in the borough within four days.

The Board in consequence decided that it was desirable that a Medical Inspector should visit the district, in order to advise as to such immediate action as might appear necessary. This duty having been deputed to me, I made arrangements by telegram for a preliminary conference with Dr. Hamilton at the Town Hall immediately on my arrival in Eccles on the following day (November 19th).

At this conference Dr. Hamilton informed me that, since his telegram to the Board was despatched, no less than thirty further cases of the fever had been notified, making seventy in all. He added that under a standing arrangement with Prof. Delépine, the Director of the Public Health Laboratories at Manchester, specimens of blood obtained from most of the patients by the medical men in attendance had been forwarded to the laboratories at the earliest possible moment, and that already, as regards forty-seven of the seventy cases, reports as to a positive reaction having been obtained with Widal's test had been received by telephone.

Enquiries had, I found, already been instituted by the sanitary staff at invaded houses, but, for the time being, it had proved quite impossible adequately to cope with the sudden stress of extra work

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involved. The results of such enquiries as had already been made disclosed the interesting fact that of sixty-six persons attacked, whose ages had been ascertained, only ten were over the age of twenty, while the ages of fifty-two ranged between five and eighteen years.

This unusual age-distribution naturally suggested the possibility of infection through the consumption of sweetmeats of one or another description, and from the officials of the sanitary authority I learnt that an impression was prevalent that "parkin," a kind of oatmeal cake, or black treacle-toffee, both of which are made locally, and had been sold in considerable quantities in the town for a week or two previous to Guy Fawkes' Day (November 5th), might be at fault. Some, at any rate, of the children attacked by enteric fever had undoubtedly partaken of one or other of these delicacies within the possible incubation period of the disease. In three of the notified cases a history of the consumption of ice-cream had been obtained.

Subsequent to my conference with Dr. Hamilton, I made, in his company, a round of visits to invaded houses in certain streets of an area of the town which, from the information in possession of the medical officer of health, appeared to be specially affected. And on the following day a further and more extended round of visits to invaded houses was made, on which occasion I had the additional assistance of Mr. Laskey, the chief sanitary inspector to the borough, the chairman of the sanitary committee also joining us in the course of our round.

During the next few days all households in respect of which notifications of cases of enteric fever had been received, were visited by the medical officer of health and his staff, and eventually, with the assistance of two extra inspectors whose services were put at the disposal of the Eccles Health Department by the Salford Corporation, a house-to-house visitation of practically the whole of the infected area of the town was accomplished. As the result, a certain number of persons evidently suffering from the disease who, however, were not being medically attended, were discovered and removed to hospital.

ENTERIC FEVER IN ECCLES.

The outbreak of enteric fever now under consideration commenced, so far as notifications of the disease were concerned, in the second week of November, 1910, but, as it appeared later on, certain of the cases then notified had been ill for varying periods of time before the medical attendant was called in. The largest number of notifications was reached within four days of the apparent commencement of the epidemic, subsequently to which they gradually decreased in number, although variations in one or another direction occurred from day to day. The actual number of persons attacked, up to the end of November, is recorded day by day in the table on p. 5.

The cases of enteric fever notified in Eccles during the months of November and December, 1910, may be more or less roughly

divided into three groups, all in the southern portion of the town, of which the main group occupied an area in the neighbourhood of the Town Hall and St. Mary's Church. And, as was pointed out by Dr. Hamilton, the houses invaded by the disease are not of quite the poorest class, the rents ranging from 4s. 6d. to 7s. a week, according to their location, and according to whether they are provided with a hot-water supply or not. It is of interest to note that not a single case of enteric fever has been reported from the better-class houses in the portion of the town north of the railway, with an approximate population of 10,800.

The explanation of this peculiar distribution of the disease will be discussed later on, when considering the question of causation of the outbreak.

During the year 1910, up to October 31st, fourteen notifications of enteric fever were received, of which none (with two exceptions, in which blood-examinations gave negative results, and a third in which, although no blood examination was available, the diagnosis was almost certainly incorrect) were notified subsequent to April 5th, so that a period of no less than seven months elapsed between notification of the last undoubted case of this fever and the commencement of the epidemic with which this report is mainly concerned.

CAUSATION OF THE OUTBREAK.

Although the peculiar age incidence of the fever indicated that some unusual source of infection might be expected to be in operation, investigation of the more usual and frequent sources for the spread of the infection of enteric fever was not neglected.

The *water supply* is obtained from the Manchester Corporation, and comes from the same source (Thirlmere) as that supplied to the City of Manchester itself. The quality of this water is excellent, and there being no record of any simultaneous outbreak of enteric fever in Manchester or Salford (which is also supplied from the same source) it became obvious that no general infection of the water supply was in question. There remained, however, the possibility of some local contamination of the mains, especially as not a single case of the disease was notified from the Ellesmere Park district of Eccles, north of the railway line. But, upon examination of a plan of the Eccles mains and service pipes, and consideration of all repairs to water-mains or service-pipes during the previous three months, it became evident that the question of water supply in connection with the outbreak could be eliminated.

Without going into unnecessary details, it will serve simply to record the fact that no evidence could be obtained pointing to the sewerage and drainage system of the town being in any way concerned in the dissemination of infection.

From enquiries made as regards possible relationship between milk supplies and the fever, it appeared that no milk was used in the invaded houses, except for puddings, other than the small quantity taken in tea. Moreover, no particular source of supply could be shown to be common to any considerable proportion of the families, one or more members of which had suffered attack by the disease.

The suspicion which, as previously stated, was locally entertained that "parkin" and black treacle-toffee might have been the means by which the disease was spread proved to be unfounded; while the possibility of infection having been disseminated by the consumption of other foodstuffs, such as shell-fish, fried fish, tomatoes, or celery, was also eventually excluded.

Early in my investigation evidence was obtained pointing to one particular source of infection as being mainly concerned in the appearance of the outbreak of enteric fever in Eccles, viz., the consumption of ice-cream, sold by two itinerant vendors in various streets of the infected area of the town, on certain dates in October, which it proved possible to determine with accuracy in many instances. The purchases of ice-cream, however, had not infrequently been made without the consent or knowledge of the parents, and in some cases notwithstanding specific instructions to the contrary, so that it was only by direct interrogation of the children—in some instances the patients themselves—that the actual facts were elicited.

The number of cases in which evidence as to the consumption of ice-cream from the incriminated source was forthcoming, is shown on the following page.

Of the cases referred to in this table, 142 in number, a definite history as to ice-cream from the incriminated sources having been partaken of was obtained in 108, or, if cases probably secondary are excluded, in 101. Other cases notified subsequent to my last visit and up to December 31st, 1910, have, as I am informed by Dr. Hamilton, brought the total number up to 166. But it is, perhaps, doubtful whether all of the 24 additional cases can be associated with the outbreak under consideration, even as secondary cases.

In view of the somewhat unusual nature of the outbreak of enteric fever under consideration, and in illustration of the statements above, it may be of interest to set out the facts elicited in regard to the consumption of ice-cream in certain invaded households, the circumstances in connection with which were personally investigated by myself.

These are as follows :—

Household A.—This household consisted of father, mother, and seven children, of whom two have been attacked by enteric fever—a boy æt. 17 and a girl æt. 9. At first the parents absolutely denied that the children had had any ice-cream recently, and said that they were certain that none had been brought into the house for, at least, the past two months. The father says he generally gives the children $\frac{1}{2}d.$ each on Sundays. On interrogating the children, however, I learnt that the girl of nine, who had been attacked by the fever, had been accustomed to get ice-cream which was bought for her by her brother of 17, also attacked by the fever, from a travelling ice-cream man in the street. On hearing this statement the mother remembered that, three Sundays previously, this boy had bought some ice-cream which he brought into the house to share with his sister. One of the children also stated that she saw her sister go out and buy ice-cream from a man in the street on Sunday, October 23rd, taking a tea-cup, as, it appears, is not unusually done

Table showing the number of persons attacked by enteric fever arranged according to dates of commencement of illness, and the number of such persons known to have consumed infected ice-cream; with notes as to the dates on which the infected ice-cream was distributed, and as to the probable dates on which infection took place.

Date.	No. of cases of illness.	No. known to have consumed infected ice-cream.
Oct. 22.	Saturday ... } —*	—
„ 23.	Sunday ... } —	—
„ 24.	1	1
„ 25.	2	1
„ 26.	—	—
„ 27.	—	—
„ 28.	2	2
„ 29.	Saturday ... } —†	1
„ 30.	Sunday ... } 2	1
Nov. 1.	5 } 2 } 8 } 1 } 8 } 10 } 9 } 2 } 1 } 4 } 10 } 11 } 18 } 8 } 9 } 5 } 7 } 4 } 1 } 1 } 4 } 1 } 1 } 2 } — } 3 } — } — }	3 2 6 1 8 8 8 1 1 4 6 8 17 4 8 2 6 2 — 1 2 1 — 2 — 1 — —

* Rounds by *both* ice-cream vendors.

† Rounds by *one* ice-cream vendor only.

a = wave corresponding to primary period of infection.

b = wave corresponding to secondary period of infection.

c = secondary cases.

Cases during week ending October 29th were probably infected from the previous week's round of the ice-cream vendors.

by children in the hope of getting more for their money than would otherwise be the case. Asked whether she knew the man's name, she at once gave it, adding that a neighbour had also seen her sister buy the ice-cream. On enquiry this statement proved correct, as the neighbour, who lives on the opposite side of the street, said that she had not only seen the child buy the ice-cream, but was further able to fix the exact date (October 23rd), owing to the fact that her mother had happened to meet with a serious accident on that particular Sunday. In answer to subsequent questions her father admitted that he was aware that the boy, who had been attacked by the fever, was very fond of ice-cream, and had bought and consumed, on occasion, as many as seven or eight halfpennyworths. As the result of my enquiries it appeared that the only members of the family who certainly had consumed ice-cream within the last month were the two only members of the family attacked by enteric fever.

Household B.—The occupants of this household were a woman, her adopted son *æt.* 30, her son *æt.* 15, and her sister. The son, *æt.* 15, is only at home on Saturdays and Sundays, when he occasionally buys ice-cream from a cart in the street. The last occasion on which he purchased ice-cream was on October 23rd, and he began to be ill on November 9th. With the exception of this boy, no one in the house had eaten any ice-cream.

Household C.—In this instance the family consisted of father, mother, and four children, of whom the eldest was attacked by enteric fever. He first felt ill on November 8th, but kept at his work till three days later. Both father and mother said they were very strict about the children's diet, and would never allow ice-cream in the house. The patient, although drowsy, was quite sensible, and stated that he had been in the habit of buying ice-cream from an Italian on Sundays, in the neighbourhood of Lane End, Market Place; the last occasion on which he had purchased any being October 23rd.

Household D.—The members of this household were husband and wife, a son *æt.* 21, and seven girls varying in age from 18–3 years. The son has been accustomed to buy ice-cream from an Italian who came round usually just before dinner-time on Sundays. The last occasion on which he ate any was on October 30th, when he bought a pennyworth. The mother and eldest daughter divided a similar quantity between them, all the rest of the girls being at Sunday School at the time. The father had none. The son, who fell ill on November 8th, is the only member of the family who was attacked by enteric fever.

Household E.—This family consisted of husband, wife, and five children (three boys and two girls). The two girls were attacked by enteric fever about November 12th. Ice-cream was purchased from an Italian vendor on Sunday, October 30th, when four half-penny ices were consumed, one each by the mother, the two girls, and the boy *æt.* five, respectively. The two elder sons were away at work on this day, and the father did not have any ice-cream.

Household F.—This household consisted of father, mother, and eight children. The mother stated that her husband had the greatest objection to the children having ice-cream, and would certainly have punished any of the children bringing it into the house. She subsequently recollected, however, that the eldest boy, aged 17, who works hard all the week and so generally stays in bed on Sunday morning, had had some ice-cream on Sunday, October 30th, about 11 a.m., having previously had no breakfast. He became ill with enteric fever on November 11th, as did also his next younger brother *æt.* 14, who had had no ice-cream in the house, but who had bought some in the street, also on October 30th.

In a number of further instances also I discovered that children who were said by their parents never to have had any ice-cream, nevertheless had surreptitiously obtained it on several occasions. Where boys were concerned, it usually appeared that they had bought and eaten it in the street, while in the case of girls it was more often bought and given to them by elder brothers, and sometimes by sisters or friends.

As further evidence of the part played by ice-cream, sold in Eccles towards the end of October last, in the dissemination of infection of enteric fever, mention may be made of the case of a woman, A. K—, residing at Swinton, who was notified to the sanitary authority there on November 16th as suffering from this disease. Enquiries have elicited the fact that she purchased ice-cream in Ellesmere Street, Eccles, on Sunday, October 23rd, and commenced to feel ill on October 30th. A companion of this woman, who also bought a halfpennyworth of ice-cream at the same time, is said to have been sick on the following Monday and Tuesday.

So soon as it became fairly evident that the consumption of ice-cream, specifically contaminated in one or another way, was concerned in the spread of enteric fever in Eccles, careful investigation was made as to the name and place of abode of all ice-cream vendors actually resident in the town, and also of any who might be in the habit, regularly or on occasion only, of coming in from neighbouring districts for the purpose of plying their trade.

Ice-cream vendors are not registered in Eccles, and at that stage of my enquiry only three persons actually living in the town were known to make and retail ice-cream ; and I was informed that none of these three had made or sold any ice-cream since the beginning of August. Subsequent investigation, however, revealed the fact that there are in Eccles at least a dozen ice-cream makers, of whom one is now known to have been selling ice-cream in a number of different streets in the borough as recently as October 30th. With regard to five of the cases attacked by enteric fever, there is a definite history of the purchase of ice-cream from this man, although in one of these complication is introduced owing to the fact that ice-cream was also bought, and probably in larger quantity, from another vendor.

It soon became obvious, however, that by far the largest retail trade in ice-cream in Eccles was done by two itinerant vendors of

Italian nationality hailing from Manchester, four miles distant. These men, possessing horsed vehicles, were accustomed to come over on Saturdays and Sundays, when they each worked a definite round in different parts of the town. They lived in a tenement house in Manchester, the ground floor of which until recently was used for making ice-cream not only by these individuals, but by at least three other residents on the premises, and by five and possibly six men living elsewhere.

From Dr. Niven, the medical officer of health of Manchester, I learnt that, prior to the date of commencement of the outbreak at Eccles, a number of cases of enteric fever had been notified from the Ancoats district of Manchester, which on enquiry were found to be associated with the ice-cream round of yet another vendor, who, although not living at the tenement house above mentioned, made his ice-cream there. This man is believed by Dr. Niven to have been the prime cause of the spread of enteric fever in the Ancoats area, and, indirectly, of the subsequent outburst of the disease at Eccles also.

ICE-CREAM MANUFACTORY.

When in Manchester on December 10th for the purpose of conferences with Dr. Niven and Professor Delépine, I took the opportunity of visiting with Dr. Niven and his tuberculosis inspector, Mr. Hewitt, the premises where the Italian ice-cream vendors in question lived, and where also they manufactured the ice-cream which they had been accustomed to sell in Eccles.

The house is a three-storeyed one, the two upper floors of which are tenanted by the elder of these two men and a number of lodgers to whom he lets rooms. Some of these lodgers also engage in the making and selling of ice-cream. To this purpose the two rooms constituting the greater portion of the ground floor are devoted. There are two entrances from the main street—the larger one opening direct into the ice-cream manufactory, the smaller giving access through a narrow passage to a small space at the foot of the staircase leading up to the living rooms.

The two rooms used for the making of ice-cream consist of the boiling room next the street and the cooling room behind it. These two rooms communicate by a door. They are well lighted, have been laid with properly channelled concrete floors, and are provided with a cold-water supply. A door at the back of the cooling room opens to the space at the foot of the staircase, which is used as a store for ice and salt. Another door from this storage place communicates with a small yard in which is a water-closet. Alongside the water-closet is a door opening into a back street. Mr. Hewitt informed me that at his previous visit to the house he found the closet nailed up, in consequence, as he was told, of improper use having been made of it by tramps and others who got in from the back street.

The whole house, when I saw it, had recently been repaired, disinfected and lime-washed. The living rooms on the first and second floor were clean; on the first-floor landing at the back is a water-closet which, as I was informed, had been used in common by all the residents, recently fourteen in number, and by some, at any

rate, of the five or six other persons who, although residing elsewhere, were engaged in the making of ice-cream on the ground floor.

The residents included the tenant, his wife, his brother, and his son. As sub-tenants he had two men (Italians), and a family (also Italians), comprising father and mother, together with five young children. The residents, therefore, numbered thirteen in all. As the result of examination of the blood of all these persons in the first week of November, 1910, six were found to yield a positive reaction of Widal's test.

Of these residents, the tenant, his brother, and three others made ice-cream in the two rooms described, as also did five other men not living on the premises. Of these five men, one is said to have been at work there for a couple of weeks only prior to October 24th, another appears not to have worked there after the first week in September, while a third is said not to have made any ice-cream "since the summer."

ROUNDS OF ICE-CREAM VENDORS.

With the exception of the tenant of the house and his brother, all these men hawked their ice-cream in certain definite rounds in the poorer parts of Manchester. The tenant and his brother served two rounds in that portion of Eccles which lies south of the railway. The two rounds covered entirely separate areas, with the exception that they usually overlapped in Ellesmere Street. These two men, as a matter of fact, were accustomed to enter Eccles by different routes, one coming by the "old road" from Manchester, the other by the "new road," which is continued as Regent Street, within the borough boundary.

In summer their visits are made daily, but in the autumn and winter on Saturdays and Sundays only, on the former of which days they are said to ply a large trade among the visitors to the numerous football matches played on that day throughout the winter season.

The last occasion on which the men, or rather one of them, visited Eccles was on Sunday, October 30th, owing to the fact that ice-cream making at the house in Manchester was stopped by Dr. Niven on November 4th—a most fortunate circumstance for Eccles, in all probability, although Dr. Niven at the time was unaware of the fact that infected ice-cream from this house had been distributed in Eccles as well as in Manchester.

Careful sifting of the evidence appears to show that in the majority of cases, at any rate, infection must have dated from Saturday or Sunday, October 22nd and 23rd, or from the Saturday or Sunday a week later (October 29th and 30th). This is shown in the table on p. 5, where the cases of enteric fever are entered in accordance with the date on which they first became definitely ill. It will be seen that the table shows two distinct waves of infection, with an interval between, the waves corresponding roughly to such dates as would permit of an incubation period varying from twelve days to a fortnight.

This table also brings out clearly another point of considerable interest, viz., the greater intensity and duration of the second wave.

This is somewhat extraordinary, for the reason that the sale of ice-cream in Eccles, on Saturday and Sunday, October 29th and 30th, was probably less in amount than on the corresponding two days of the previous week, owing to the fact that only one of the two vendors visited Eccles on these dates, the other having left Manchester for Italy on Monday, October 24th.

On questioning the former of these men, some weeks later, as to the precise rounds which he made on October 29th and 30th, I learnt from him that he came in to Eccles by the new road so as to cover what ordinarily constituted his brother's round, after which, on the Saturday, he went over a small portion of his own round, until his stock was exhausted, finishing in Ellesmere Street. As to the following day he did not appear very certain, but again traversing his brother's round he believes that he had sold all the ice-cream he had brought with him before he had gone over more than about half the ground usually covered.

The cases of enteric fever referable to infection contracted about October 23rd and 30th were aggregated in specially marked fashion in an area in which, if Ellesmere Street be included, the greater portion at any rate of this man's trade must have been done at the two periods specially in question.

Infectivity of the ice-cream manufactured at the house in Manchester, by certain of the workers there, would appear, as indicated by the earlier Manchester cases, to have commenced on a date probably about September 19th, and to have become more intensive week by week, reaching its highest point by October 29th and 30th, shortly before the manufacture was stopped by the Manchester sanitary authority. It is of interest also to learn that Prof. Delépine obtained somewhat atypical results as regards Widal's test from the blood of the earlier cases in Manchester, whereas in his bacteriological report on the Eccles cases, which I append, he states that he found them quite typical.

OUTBREAK OF ENTERIC FEVER IN THE ARDWICK DISTRICT OF MANCHESTER.

For particulars as to this outbreak, the earlier cases of which antedated, by about three weeks, marked prevalence of the disease in Eccles, I have to thank Dr. Niven, with whom I have had the opportunity of conferring on several occasions, and who has also placed at my disposal a copy of a preliminary report dealing with his investigation of the outbreak in Manchester.

In the week ending October 27th, 1910, seven cases of enteric fever were notified from the Ardwick sanitary district, all in children. Local enquiry served to exclude water, milk, shell-fish, and other food-stuffs as responsible for spread of the disease, while it appeared that in each instance the facts elicited by the district sanitary inspector pointed to ice-cream purchased from a street hawker as the source of infection. As the result of further investigation it was ascertained that the incriminated ice-cream was sold by an Italian living in the Ancoats district, but manufacturing ice-cream at some distance from his

dwelling in the tenement house previously described. This man and his wife, together with two sons and a daughter, inhabit a dark four-roomed house of two stories in a narrow street, which is one of the few remaining houses in Manchester provided with a slop-closet. The general sanitary condition of the premises was found to be decidedly unsatisfactory. Mr. Hewitt, the tuberculosis inspector, on visiting this house on October 28th, found one of the sons, aged 17, in bed, suffering from headache, backache and constipation. Samples of blood from this boy and his mother taken by the medical attendant on this, and on the following day, both gave a positive Widal reaction. But no history of illness resembling enteric fever could be obtained as regards either the man or his wife; and although examinations of the fæces and urine of each member of this family have been carried out in Prof. Delépine's laboratory, no evidence has thus far been obtained indicating that either this man or his wife is a chronic typhoid "carrier." Neither was the typhoid bacillus isolated from the excretions of any of the persons living in or engaged at the tenement house where the ice-cream was manufactured. But at various dates between November 9th and December 14th, 1910, a paratyphoid bacillus has been isolated in Prof. Delépine's laboratory from either the urine or fæces of five of these persons, as also from both urine and fæces of the wife of the man referred to above. Apparently no examination of the excretions appears to have been made in the case of one of the two brothers who sold ice-cream in Eccles.

Nevertheless, on October 29th, the medical officer of health wrote to the elder brother (the tenant) forbidding him to make or sell any ice-cream until further notice. A day or two later, however, information having been received that he was contravening this notice, the tenement house (a description of which has already been given) was visited, and a quantity of ice-cream which had just been made was destroyed, with the exception of a small sample which was retained for bacteriological examination. This subsequently proved to contain vast numbers of the colon bacillus.

On subsequently carrying out a house-to-house enquiry in the Ardwick district, other cases of illness were discovered, and blood from each patient was examined by the Widal test, with the result that, in all, thirty cases have been found yielding a positive reaction, of which twenty were obviously primary and the remaining ten secondary. These secondary cases, including three adults, have been generally more severe than the primary attacks, and one has terminated fatally.

In consequence of the positive blood reactions obtained in Prof. Delépine's laboratory, the medical officer of health, on November 4th, again wrote to the tenant of the premises on which the ice-cream was manufactured, requiring him to cease making and selling ice-cream, and warning him not to allow ice-cream to be made by other persons on his premises; and as the result of this action, no ice-cream, so far as can be ascertained, was made or sold by any person at this place between October 30th and December 10th, just previous to which date, by a misapprehension, the embargo of the medical officer of health had been definitely removed. On the latter date, with Dr. Niven and his inspector, I visited the

house in question, when we found a large tin of ice-cream set to cool in the back room, and we learnt from the tenant's wife that a further quantity had been made, with which her husband had, shortly before, started off on a round.

As soon as possible, therefore, I communicated with Dr. Hamilton at Eccles, who arranged for the two roads into Eccles from Manchester to be watched by the local police. I have since heard, however, from Dr. Niven that the man's round on that day was found to have been confined to Manchester; and that special attention has since been paid to the district visited by him, in view of possible appearance in the neighbourhood of cases of enteric fever due to consumption of ice-cream sold by him on that occasion.

Dr. Niven explains that this man had been given permission to recommence operations owing to his connection with the outbreak of enteric fever in Eccles not having been realized in Manchester; and adds that immediately attention was directed to this fact, the permit was at once withdrawn.

Still more recently I have learnt that a group of cases of enteric fever have been reported from another district of Manchester, in the neighbourhood of Queen's Road, Harpurhey, of which some, at any rate, would seem to have had relation to an ice-cream "round" worked by a son of the vendor, who, with his brother, has been shown to have been responsible for the outbreak in Eccles.

SANITARY ADMINISTRATION.

Eccles, a municipal borough, possessing a population of 34,369 at the census of 1901, is co-terminous, on the east, with the County Borough of Salford, and is distant, by road, about four miles from Manchester.

The sanitary committee of the town council, consisting of nine members, meets ordinarily once a month, but further special meetings are held as occasion demands. During the recent prevalence of enteric fever in the borough the committee held evening meetings every other day.

The town council do not possess an isolation hospital for cases of infectious disease, but they have an arrangement with the Salford Corporation for the treatment of cases from Eccles, in the Ladywell Sanatorium, Salford, which is situated just outside the Eccles Borough boundary.

As stated earlier in this report, opportunity is afforded to every medical practitioner to obtain a bacteriological diagnosis in cases which clinically present the appearances of enteric fever, by posting specimens of blood to Prof. Sheridan Delépine, at the Manchester Public Health Laboratories. Special outfits for the dispatch of blood samples for this purpose are kept in stock at the Town Hall, Eccles.

Full advantage of these facilities had been taken from the very commencement of the present outbreak, as I learnt at the time of my first visit to Eccles, although, as I was also informed, objection had been raised in certain quarters to what was considered the need-

less expense to the rates of the removal of as many cases as possible to the Salford Sanatorium.

Opportunity having been afforded me of attending a meeting of the sanitary committee on the evening following my arrival in Eccles, I took advantage of the occasion to congratulate the members on the success which had attended the efforts to secure the removal to hospital, as speedily as possible after notification, of all cases of the disease, with the exception of a few instances in which the medical attendant had certified that such a course was unnecessary, or the patients or their relatives had raised objections. In this connection also I pointed out that although it was practically certain that secondary cases would occur after an interval of about ten days or a fortnight, the number would be likely to be materially lessened in consequence of the speedy removal from invaded dwellings of the patients first attacked.

At this meeting also I stated that as the results of my visits of inspection earlier in the day, I had arrived at the opinion that the epidemic of enteric fever, from which the town was suffering, was probably due, in large part, at any rate, to the consumption of ice-cream purchased from itinerant vendors on one or other, or both, of two particular dates in the previous month, the persons affected being, for the most part, children and youths between the ages of five and eighteen years ; and I suggested, therefore, that steps should be taken to stop entirely, until further notice, the sale of ice-cream in the streets, the assistance of the police being invoked to prevent especially ice-cream vendors from Manchester coming into the town.

I further suggested, in view of the fact that the sanitary staff, although working overtime, had been quite unable to cope with the sudden stress of work, that the medical officer of health should be afforded a temporary assistant, qualified in public health work ; and also that a couple of extra temporary sanitary inspectors should be appointed. It would then be possible to make a house-to-house inspection of the invaded areas of the town with the object of discovering any cases of the disease who might have escaped notification owing, for instance, to no medical men having been called in to attend the patient.

To these suggestions the sanitary committee at once gave their unanimous assent, it being left to Dr. Hamilton, the medical officer of health, to make the necessary arrangements. Within a day or two Dr. Hamilton obtained the assistance of a medical man (Dr. Ward), who had been working in Prof. Delépine's laboratory at Manchester ; while the Salford Corporation were public-spirited enough to lend the services of two of their inspectors, to whom was entrusted the work of house-to-house visitation. The value of this work was demonstrated by the fact that, as I learn from Dr. Hamilton, several persons were discovered who, although unnotified, were apparently suffering from enteric fever, and whose blood, on bacterioscopic examination for Widal's test, gave a positive reaction. Where this was so the patient was at once removed to hospital.

Owing to the large number of cases notified within the first few days after the presence of an outbreak of enteric fever in the town had become recognized, the strain on the isolation accommodation

available at the Salford Sanatorium became very great, and at one period the medical superintendent was forced to request Dr. Hamilton not to send in any further cases for a short time, pending arrangements for the provision of further accommodation. The Salford Corporation certainly did everything in their power to assist the Eccles Town Council to tide over the crisis, and as regards hospital accommodation, informed the chairman of the sanitary committee that they would be prepared, at a few hours' notice, to allow the use of their new hospital (not yet opened at the time of my first visit) for patients from Eccles, should it prove impossible to provide the necessary accommodation at the sanatorium.

So soon as it appeared certain that the causation of the epidemic had been determined, Dr. Hamilton drew up a warning notice against the eating of ice-cream, which, printed in red ink on bills of large size, was soon posted in prominent positions in various parts of the town. Hand-bills as to "Rules for preventing the spread of enteric or typhoid fever," "Caution to householders against the commission of acts by which infectious disease may be spread," and "Suggestions for preventing the spread of infectious disease," with particular reference to the supply and use of special pails for the reception of typhoid excreta, were also distributed from door to door in the infected area of the town.

Among other routine preventive measures adopted, it may be mentioned that the water-closets and drains of all houses in which a case of enteric fever occurred were treated with a disinfectant solution, the special pails, referred to above, being also supplied in those instances in which the patient was not removed to hospital. The closets and drains of the Parish Church schools and the Clarendon Road council schools were also disinfected. The privy-middens of two of the few remaining houses not yet connected with the sewerage system, from which cases were notified, were cleansed, and the midden pits disinfected as thoroughly as possible, having regard to the structural difficulties involved.

Eccles Parish Church schools were closed by order of the health committee from November 22nd to December 5th, 1910.

Shops in connection with dwellings in which cases occurred were also required to close until further notice, while in three instances a supply of "sweets" which came under suspicion was removed and destroyed, compensation being subsequently made to the shop-keeper by the town council.

"Contacts" working in laundries, or in shops or other places where articles of food were handled, were kept from work for a period of a fortnight.

While as yet it remained uncertain as to whether either water or milk might be concerned in the spread of the disease, the water supply to the fountain on Eccles Cross was turned off, and householders were warned to boil any water or milk they might use for drinking purposes. The medical officer of health also sent to each milk vendor in the borough a copy of a circular letter, in which he requested them to take steps to ensure that, while the epidemic lasted, no cans should be taken into houses, in order to avoid possible risk of infection being transferred by this means.

Lastly, two samples of ice-cream, two of treacle-toffee, and one of water were sent to Prof. Delépine for bacteriological examination.

In concluding this report, I desire cordially to thank all those to whom I am so much indebted for courteous and ready assistance in the conduct of my investigation, among whom I would specially mention Dr. Hamilton, Medical Officer of Health for Eccles, Mr. Laskey, the Chief Sanitary Inspector, and Mr. Alderman Parr, J.P., Chairman of the Sanitary Committee of the Eccles Town Council; Dr. Niven, Medical Officer of Health for Manchester, his assistant, Dr. Hutchinson, and his Inspector, Mr. Hewitt; also Prof. Delépine, Director of the Public Health Laboratories, Manchester. A special word of praise is due to all the Officials of the Health Department at Eccles, who, at the time of my first visit, worked energetically and uncomplainingly all through a Sunday, and for long after the usual office hours for several days on end, in order to deal with the enormous amount of extra work entailed in connection with the outbreak of enteric fever.

S. MONCKTON COPEMAN.

APPENDIX.

BACTERIOLOGICAL REPORT UPON THE OUTBREAK OF TYPHOID FEVER WHICH OCCURRED IN ECCLES DURING THE MONTH OF NOVEMBER, 1910, by S. DELÉPINE, Director of the Public Health Laboratory, University of Manchester.

Between November 14th and November 18th a large number of specimens of blood were sent to me from Eccles, and an unusual proportion of these specimens gave a very well-marked typhoid reaction.

This excessive proportion of positive reactions occurring in young children, as well as the large number of cases, attracted my attention to the possibility of some unusual factor being at work. On November 18th I had the opportunity of discussing the matter with Dr. Hamilton, and to ask him that, in the event of a case terminating fatally, he would have the kindness to send the spleen to me for bacteriological examination.

On November 21st I received from the Ladywell Sanatorium the spleen of Mabel H—, æt. 9 (LB-4246), of 109, Ellesmere Street, who had died at that institution. Pure cultures of typical typhoid bacilli were obtained from that organ. These bacilli reacted with the blood of other patients affected by the outbreak in the same way as the typhoid bacilli forming part of the laboratory stock of cultures.

The outbreak was, therefore, undoubtedly one of typhoid fever.

As an outbreak of typhoid fever attributed to the consumption of ice-cream was being investigated at the time in Manchester, a connection between the two outbreaks appeared possible.

Although it did not appear likely that the ice-cream collected in the third week in November would exhibit any evidence of the infection to which the outbreak was attributable, two samples of ice-cream were forwarded to me on November 21st (LB-4245). These samples were found to contain a very large number of bacteria cultivable on gelatine at 20° C., 14,800,000 and 18,000,000 per cc. respectively, but no evidence of specific pollution was obtained.

In order to ascertain how far it was possible to find bacteriological evidence throwing light upon the character of the November outbreak, I have analysed the records which I have kept of the examination of the blood of persons living in Eccles between the years 1897 and 1910 inclusive, and who had been affected with illnesses which on clinical grounds were suspected of being possibly typhoid fever.

The value of these records is in great part due to the fact that the method of testing for the Widal's reaction which I devised and elaborated in 1896 has been used during the whole period and has undergone no modification, so that the results obtained in 1897 are absolutely comparable with those obtained in 1910. (This method was described in the "Medical Chronicle" for October, 1896, and the "Lancet," December 5th, 1896.)

(The following analysis which was prepared on December 1st, 1910, does not include some 14 cases which have been investigated between November 27th and December 7th, except when it has been possible to introduce these cases in the returns without inconvenience.) Between the years 1897 to 1909 inclusive 387 cases were notified to the Eccles medical officer of health as being certainly or possibly cases of typhoid fever. Of these cases 324 were tested bacteriologically in my laboratory, so that on an average over 84 per cent. of the suspected cases have been tested bacteriologically. During the November outbreak samples of the blood of patients residing in 51 streets were examined. Between the 8th and the 28th of November 140 persons residing in these 51 streets were thus examined.

During the 14 years (1897-1910) preceding the outbreak the blood of 62 persons residing in the same streets was examined with the view of finding whether they were affected with typhoid fever.

Out of these 62 persons, 19 gave a positive reaction, or 30·4 per cent.

Of the 140 cases investigated between November 8th and November 28th, 87 gave a positive reaction, or 61·77 per cent.

There were, therefore, on an average, more cases of typhoid fever occurring daily during the outbreak than yearly during the preceding period of 14 years. There can be no doubt, therefore, that both as regards the number of cases and the specificity of the disease, the districts in question were affected in an unprecedented manner.

A study of the spot maps supplied to me by Dr. Hamilton shows that most of the cases may be arranged in three groups, according to the part of the town in which they occurred during the months of November and December.

Group A in the neighbourhood of the Town Hall and of St. Mary's Church.

Group B in or about Patricroft, with Ellesmere Street as a centre.

Sub-Group C also situated in Patricroft, but quite distinct from Group B.

The examinations of blood samples obtained from persons residing in these three areas yielded the following results:—

				Before October, 1910				Since October, 1910.			
				+	—	Total.	+ Per cent. of Total.	+	—	Total.	+ Per cent. of Total.
Group A	...	...	...	16	20	36	44	62	27	89	69·4
Group B	...	...	...	5	19	24	20·8	14	7	21	67
Group C	...	...	...	0	0	0	—	4	1	5	80

(This table includes all the cases up to December 2nd, 1910, and therefore a few more cases than those upon which the previous summary is based.) It is clear from these figures that although areas A, B and C are topographically distinct, they must all have been during the month of November under a special pathogenic influence, which gave rise in every one of them to a remarkable increase in the incidence of typhoid fever.

Another feature of the outbreak is its suddenness. Allowing for variations in the duration of the incubation period and for the unavoidable delays attending the discovery of cases not under proper medical treatment, or unnoticed at first owing to the slightness of symptoms, it appears probable that all the cases discovered between the 14th and the 21st of November were infected on the same day or, at any rate, within a very limited period of time. It is even possible that the same supposition is applicable to all the cases observed up to the end of November.

As the evidence points quite clearly to the ice-cream sold by two brothers as the source of infection, it seems certain that the ice-cream sold by those persons must have been on one or two occasions *extensively and almost uniformly* infected with typhoid bacilli. This kind of infection could only be accounted for by the *multiplication of typhoid bacilli* introduced either by infected hands, or by vessels infected by *faecally-polluted* water, or by infected milk, or in any other way, into the warm mixture used in the preparation of ice-cream, while that mixture was in process of cooling previous to freezing. This infection must have taken place some time during the last week in October or in the first week in November. (It actually took place during the last two weeks of October.)

The age incidence shows that during the recent outbreak persons

between the ages of 5 and 20 were much more affected than persons at other ages ; this is what might be expected in the case of an outbreak due to the consumption of ice-cream.

Both before and during the outbreak the proportion of enteric cases, and of continued fever attributable to typhoid infections, was greatest in the *five to nine years' period* than in any other period. The proportion of clear typhoid infections was, with a slight exception, greater at all ages during the recent epidemic than during the previous fourteen years. These facts are brought out clearly in the following table :—

TABLE SHOWING THE AGE INCIDENCE OF TYPHOID FEVER
IN CASES THE BLOOD OF WHOM WAS EXAMINED AT THE
PUBLIC HEALTH LABORATORY.

Ages.	1897 up to October, 1910.				November 14th to December 2nd, 1910.			
	+	—	Total.	+ Per cent. of Total.	+	—	Total.	+ Per cent. of Total.
0 to 4 years inclusive ...	1	2	3	33	8	10	18	44
5 to 9 " " ...	3	1	4	75	27	7	34	79
10 to 19 " " ...	4	7	11	36	37	16	53	69
20 to 29 " " ...	4	6	10	40	6	12	18	33
30 to 39 " " ...	4	11	15	26	6	5	11	54
40 years and above ...	5	15	20	25	1	1	2	50

The general table accompanying this report* shows how the various streets referred to in the test have been affected during the last 14 years. It also gives a summary of cases notified yearly as cases of enteric fever, the number of deaths from enteric fever, the number of cases the blood of which has been examined each year at the Public Health Laboratory, and the number of cases giving a positive reaction.

Before concluding this report I wish to state that most of the bacteriological examinations referred to have been made by Dr. Sidebotham, Dr. Carver and Dr. Sellers, to whom I must express my thanks for the able way in which they have assisted me.

(Signed) SHERIDAN DELÉPINE.

December 6th, 1910.

* Not reproduced.

